SECTION 16481

MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. AC motor control devices rated 600V and less that are not an integral part of equipment or motor control centers.

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Edit 1 through 3 to match Project requirements.

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1. Manual motor controllers for fractional horsepower motors.

2. Magnetic motor controllers, full-voltage, non-reversing.

3. Combination magnetic motor controllers, full-voltage, non-reversing.

1.2 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70 - *National Electrical Code*.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purposes specified and shown.

1.3 SUBMITTALS

A. Provide the following submittals according to the requirements of Sections 01300 and 01700.

1. Catalog Data: Submit manufacturer's technical data for each type of motor controller and starter, including data proving that materials comply with specified requirements. Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

2. Wiring Diagram

3. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

4. Operation and maintenance instructions.

1.4 COORDINATION

Coordinate the features of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, load, the pilot device, and control circuit affecting controller functions. Provide controllers that are horsepower rated to suit the motor controlled.

1.5 EXTRA MATERIALS

Furnish one spare for every five installed fuses, but not less than one set of three of each kind.

PART 2 PRODUCTS

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Edit 2.1 to match Project requirements.
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2.1 FRACTIONAL HORSEPOWER MANUAL MOTOR CONTROLLERS

A. Provide AC general purpose Class A manually operated, full-voltage controller for fractional horsepower motors that conforms to the requirements of NEMA ICS 2 - *Industrial Control Devices, Controllers, and Assemblies*.

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Edit B to match Project requirements.
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B. Provide starter with thermal overload unit, red pilot light, and [key] [toggle] operator.

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Edit C to match Project requirements.
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C. Provide enclosure in accordance with ANSI/NEMA ICS 6 - *Enclosures for Industrial Controls and Systems*, Type [1 (surface).] [1 (flush)] [3R.] [4.] [as indicated on the Drawings.] Include handle guard with provisions for padlocking in the OFF position.

D. Manufacturer: Square D “Class 2510 Type F”, Cutler-Hammer/Westinghouse, Allen-Bradley.

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Edit 2.2 to match Project requirements.
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2.2 MAGNETIC MOTOR CONTROLLERS - NON-REVERSING:

A. Provide AC general purpose Class A magnetic, full-voltage, non-reversing controllers for induction motors rated in horsepower that conforms to the requirements of NEMA ICS 2 - *Industrial Control Devices, Controllers, and Assemblies*.

B. Provide products suitable for operation at an altitude of 7500 ft. above sea level.

C. Coil shall be of the encapsulated type. Coil operating voltage shall be 120 volts, 60 Hz.

D. Provide controllers of size and number of poles as indicated on the Drawings.

E. Contacts shall be totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

F. Wiring shall be “straight-through” with all terminals clearly marked.

G. Provide solid-state overload units with the following characteristics:

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Edit 1 to match Project requirements. Class 20 tripping is suitable for most applications.

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1. NEMA Class 20 tripping characteristics
2. Field selectable motor full load current.
3. Ambient temperature insensitive.
4. Phase loss protection.
5. Manual reset after time delay.

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Edit H. to match Project requirements.

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H. Provide enclosure in accordance with ANSI/NEMA ICS 6 - *Enclosures for Industrial Controls and Systems*, Type [1.] [3R.] [4.] [4X] [12.] [as indicated on the Drawings.] [as required to meet conditions of installation.]

I. Provide not less than two sets of NEMA ICS 2 field convertible auxiliary contacts in addition to the seal-in contact.

J. Provide cover mounted, heavy duty, 22 mm or 30 mm, metal operator, oil tight pilot devices as listed below with NEMA ICS 2, Form Z, A600 rated contacts.

1. Push buttons:
    a. Mushroom head, maintained action, turn-to-release STOP pushbutton.
    b. Recessed, momentary contact START pushbutton.
2. Push-to-test LED type indicating lights:
    a. Red RUNNING pilot light.
    b. Green STOPPED pilot light.
3. Selector Switches: Rotary type HAND - OFF - AUTO.
4. Provide legend plates for pushbuttons, pilot lights and selector switches.

K. Provide externally operable manual reset operator.

L. Provide a control power transformer in each motor starter. The transformer shall have 120 volt secondary and sufficient capacity to operate starter coil and all connected pilot, indicating and control devices, plus 100 percent spare capacity. Provide fused primary and secondary. Bond unfused leg of secondary to enclosure. Provide fuse blown indicating fuses.

M. Manufacturer: Square D “Class 8536 Type S”, Cutler-Hammer/Westinghouse, Allen-Bradley.

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Edit 2.3 to match Project requirements.

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2.3 CIRCUIT BREAKER TYPE COMBINATION MAGNETIC MOTOR CONTROLLERS - NON-REVERSING

A. Provide combination magnetic motor controllers with motor circuit protector disconnect in a common enclosure.

B. Provide products suitable for operation at an altitude of 7500 ft. above sea level.

C. Motor circuit protector shall conform to NEMA AB 1 - *Molded Case Circuit Breakers*, with an integral instantaneous magnetic trip in each pole.

1. Trip units shall be calibrated to coordinate with the actual locked-rotor current of the connected motor and the controller overload relays.

2. Provide breakers that are factory assembled with the controller, interlocked with unit cover or door, and arranged to disconnect the controller.

3. Circuit breaker shall have a color coded externally operated handle. Operating handle shall give positive visual indication of ON- OFF with red and black color coding. Include provisions for padlocking handle in the OFF position.

D. Provide AC general purpose Class A magnetic, full-voltage, non-reversing controllers for induction motors rated in horsepower that conforms to the requirements of NEMA ICS 2 - *Industrial Control Devices, Controllers, and Assemblies*.

E. Coil shall be of the encapsulated type. Coil operating voltage shall be 120 volts, 60 Hz.

F. Provide controllers of size and number of poles as indicated on the Drawings.

G. Contacts shall be totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement small be possible without disturbing line or load wiring.

H. Wiring shall be “straight-through” with all terminals clearly marked.

I. Provide solid-state overload units with the following characteristics:

****

Edit 1 to match Project requirements. Class 20 tripping is suitable for most applications.

****

1. NEMA Class 20 tripping characteristics

2. Field selectable motor full load current.

3. Ambient temperature insensitive.

4. Phase loss protection.

5. Manual reset after time delay.

****
Edit J to match Project requirements.
****

J. Provide enclosure in accordance with ANSI/NEMA ICS 6 - *Enclosures for Industrial Controls and Systems*, Type [1.] [3R.] [4.] [4X] [12.] [as indicated on the Drawings.] [as required to meet conditions of installation.]

K. Provide not less than two sets of NEMA ICS 2 field convertible auxiliary contacts in addition to the seal-in contact.

L. Provide cover mounted, heavy duty, 22 mm or 30 mm, metal operator, oil tight pilot devices as listed below with NEMA ICS 2, Form Z, A600 rated contacts.

1. Push buttons:

a. Mushroom head, maintained action, turn-to-release STOP pushbutton.

b. Recessed, momentary contact START pushbutton.

2. Push-to-test LED type indicating lights:

a. Red RUNNING pilot light.

b. Green STOPPED pilot light.

3. Selector Switches: Rotary type HAND - OFF - AUTO.

4. Provide legend plates for pushbuttons, pilot lights and selector switches.

M. Provide externally operable manual reset operator.

N. Provide a control power transformer in each motor starter. The transformer shall have 120 volt secondary and sufficient capacity to operate starter coil and all connected pilot, indicating and control devices, plus 100 percent spare capacity. Provide fused primary and secondary. Bond unfused leg of secondary to enclosure. Provide fuse blown indicating fuses.

O. Manufacturer: Square D “Class 8539 Type S”, Cutler-Hammer/Westinghouse, Allen-Bradley.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motor control equipment where indicated on the Drawings and according to manufacturer's instructions.

B. Mount with operating mechanism 5'-0" above floor or as indicated on the Drawings. Install enclosed controllers plumb. Provide supports according to Section 16190 ELECTRICAL SUPPORTING DEVICES.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not furnished, use those specified in UL 486A.

D. Ground motor controllers according to Section 16450 - SECONDARY GROUNDING.

E. Set overload relays or install overload heater elements in motor controllers to match installed motor characteristics.

F. Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

G. Identify motor controllers and install warning signs according to Section 16195 - ELECTRICAL IDENTIFICATION.

3.2 FIELD QUALITY CONTROL

A. Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing before energizing motor controllers. Correct any deficiencies before energizing controller.

B. Verify proper overloads are installed or set for the motor nameplate full load current and duty.

C. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

END OF SECTION